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# A

## Answers to Study Guide Questions

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### Chapter Two Knowledge Check

1. A prime coat on aggregate base is required on all state jobs.
  - a. True
  - b. False**
2. The purpose of a tack coat is to ensure a bond between the existing pavement surface and the new asphalt overlay.
  - a. True**
  - b. False
3. The material taken off the roadway when milling may not be used again.
  - a. True
  - b. False**

## Chapter Three Knowledge Check

1. When an “end dump” truck raises it’s bed to deliver mix into the hopper of the paver, the bed should not be in contact when the hopper and should not press down on or ride on the paver.
  - a. **True**
  - b. False
2. Contact between the hauling truck bed and the paver is never a problem.
  - a. True
  - b. **False**
3. In Virginia, haul trucks are required to be equipped with tarps\_\_\_\_\_
  - a. Only during rain storms.
  - b. Only when the roadway temperature goes below 40F.
  - c. **All the time.**
  - d. Only when your supervisor tells you to put one on.
4. The bed of the haul truck should be free of all deleterious materials before mix is placed in it.
  - a. **True**
  - b. False
5. When using diesel fuel as a release agent the residue must be dumped:
  - a. In a container listed on the Departments approved list.
  - b. Onto the ground in a well drained area.
  - c. **Diesel fuel should never be used as a release agent.**
  - d. Only at a VDOT Residency.
6. Some mixes are more prone to segregation than others and special care must be taken to ensure the mix load is as uniform as possible.
  - a. **True**
  - b. False
7. When a semi-tractor trailer is to be loaded, the mix should first be deposited at the\_\_\_\_\_
  - a. Back of a trailer.
  - b. Middle of the trailer.
  - c. **Front of the trailer.**
  - d. Middle and work towards the back.
8. When using an end dump or live bottom truck to deliver mix to the paver, the truck driver should back the truck up to the laydown machine but stop just short of the push rollers on the front of the paver.
  - a. **True**
  - b. False
9. The crust that forms on an asphalt mixture is acceptable if the temperature of the mix is greater than 225F.
  - a. True
  - b. **False**
10. Too much breaking force from the haul truck may cause the paver to slip and affect the mat.
  - a. **True**
  - b. False

## Chapter Four Knowledge Check

1. The paver consists of two primary parts: the tractor unit and the screed unit.
  - a. **True**
  - b. False
2. The proper depth of material on the augers should be at the \_\_\_\_\_.
  - a. Fill mark on the auger shaft.
  - b. Top of the auger shaft
  - c. Two inch mark of the auger shaft.
  - d. **Center of the auger shaft.**
3. The primary key to the placement of a smooth pavement layer is the use of the new material feed system to keep a constant head (level) of material in front of the screed.
  - a. **True**
  - b. False
4. The screed unit is attached to the tractor at:
  - a. **One point on each side of the paver.**
  - b. Two points on each side of the paver.
  - c. Three points on each side of the paver.
5. The amount of density obtained by the paver screed is also a function of the speed of the paver.
  - a. **True**
  - b. False
6. The primary purpose of the heater or burner on the screed is to assist in reheating the asphalt mix to make up for heat loss during transit.
  - a. True
  - b. **False**
7. When changing the thickness control screws or tow point position, it takes \_\_\_\_\_ before an adjustment is completed.
  - a. 15 minutes
  - b. One tow length of the paver
  - c. **Five tow lengths of the paver**
8. When changing trucks during paving, it is best if the transfer is accomplished without slowing down or stopping the paver.
  - a. **True**
  - b. False
9. Auger operation and conveyor operation should be adjusted to keep them running as close to \_\_\_\_\_ percent of the time as possible.
  - a. 80
  - b. 90
  - c. 95
  - d. **100**

## Chapter Five Knowledge Check

1. A \_\_\_\_\_ joint occurs when one lane of asphalt mix is constructed adjacent to a previously placed lane of mix.
  - a. **Longitudinal**
  - b. Conventional
  - c. Transverse
  - d. Uniform
2. One key to the construction of a good longitudinal joint between lanes of asphalt mix is the amount of overlap between the new mat and the previously placed mat.
  - a. **True**
  - b. False
3. When the placement of the asphalt mix is to be suspended for a period of time and traffic is going to be passing over the end of the paving, a vertical butt joint may be constructed.
  - a. True
  - b. **False**
4. Constructing a temporary tapered joint using sand or dirt as the bond-breaking medium is **not** an acceptable VDOT paving practice.
  - a. **True**
  - b. false

## Chapter Six Knowledge Check

1. The density of a material is simply the weight of the material that occupies a certain volume of space, typically described as pounds per cubic foot (lb/ft<sup>3</sup>).
  - a. **True**
  - b. False
  - c.
2. A pass is defined as the entire roller moving over \_\_\_\_\_ point(s) in the mat at one time.
  - a. **One**
  - b. Two
  - c. Three
  - d. Four
3. A dense-graded aggregate may be easier to compact than a mixture with any other aggregate gradation.
  - a. **True**
  - b. False
4. A thin layer of mix will cool more quickly in a strong wind than when there is little or no wind.
  - a. **True**
  - b. False
5. The primary compaction variables for all types of rollers that can be controlled using the rolling process are:
  - a. Roller speed
  - b. Number of roller passes
  - c. Rolling zone
  - d. Rolling pattern
  - e. **All of the above**
6. Compactive effort is significantly improved at slower roller speeds.
  - a. **True**
  - b. false

## Chapter Eight Knowledge Check

1. What are important qualifications for an Inspector?
  - a. Knowledge, common sense
  - b. Diplomacy, observation skills
  - c. **All of the above**
2. The most effective learning tool for an Inspector is on-the-job training.
  - a. **True**
  - b. False
3. What is the minimum placement temperature for PG-64-22 mix type A?
  - a. 375°F
  - b. 200°F
  - c. **250°F**
  - d. 270°F
4. The Paving Inspector must keep a daily diary.
  - a. **True**
  - b. False
5. What is the purpose of inspection?
  - a. Control the quantity of work
  - b. Inspector to act as foreman for the Contractor
  - c. **Ensure the quality of work**
  - d. All of the above
6. Each load arrives on the job site accompanied by a \_\_\_\_\_.
  - a. TL-52A
  - b. **Weigh ticket**
  - c. TL-102A
  - d. Daily diary
7. In order to accept asphalt concrete the Department must have:
  - a. An approved mix design
  - b. A producer who is under VDOT's Quality Assurance Program
  - c. A good water source
  - d. **Both A and B**
8. It is important for an Inspector to have an understanding of what tests are required both on the road and at the plant.
  - a. **True**
  - b. False

**Specification Practice**

Below is an exercise in looking up specifications. All answers can be found in VDOT Road and Bridge Specifications Section 315 – Asphalt concrete Pavement and Special Provisions.

1. What section is equipment for asphalt concrete pavement found?

**315.03 Equipment**

2. What is the equipment and application requirement for tacking joints? What section is this found in?

**Tack at joints applied with a hand wand or spray bar at the rate of 0.2 gal/yd<sup>2</sup>.**

**Special Provision Section 315.05 (b) 1.b.**

3. In section 315.05(d) the compacting sub-section of Procedures states, "Rolling shall not cause\_\_\_\_\_".

**"undue displacement, shoving or cracking."**

4. The variation of the surface from the testing edge of the straightedge between any two contacts with the surface shall not be more than\_\_\_\_\_. This is found in Section\_\_\_\_\_.

**"1/4 inch"**

**"315.07(a) Surface Tolerance"**

5. How much should a longitudinal joint in one layer be offset from the layer immediately below? What section is this found in?

**6"**

**Section 315.05 ( c )**

6. What is the pay unit for asphalt concrete material? This is found in what section?

**Tons**

**Section 315.08**

## Chapter Nine Knowledge Check

1. Before a roller pattern is constructed:
  - a. The number of roller passes should established
  - b. Three hundred feet must be measured off
  - c. The roller operator must be Asphalt Field certified
  - d. **A minimum of 500 feet of mix should be placed**
2. A roller pattern compares compactive effort vs. density?
  - a. **True**
  - b. False
3. To mark the locations for the roller pattern density testing:
  - a. Marking is not necessary
  - b. **Use the nuclear gauge template and spray paint**
  - c. Place the gauge in position and spray paint around the edges
  - d. First select numbers from the random number table
4. Who has the responsibility of furnishing and operating the thin-lift nuclear gauge?
  - a. VDOT furnishes and operates the gauge.
  - b. **The Contractor furnishes the gauge and it must be operated by an Asphalt Field Certified Technician**
  - c. The Research Council furnishes the gauge and must be operated by the Engineer.
  - d. VDOT furnishes the gauge, but it must be operated by the Contractor.
5. What determines whether the control strip passes?
  - a. The average of the ten readings in the control strip meets or exceeds the minimum density requirement
  - b. **The average of 6 plugs/cores meets or exceeds the minimum density requirement**
  - c. One plug/core meets or exceeds the minimum density requirement
  - d. The average of the ten readings in the control strip is between 98% and 102% of the job-mix density

6. Readings for the ten locations selected in the control strip are to be taken with the thin-lift nuclear gauge in the:
- a. 15 second mode
  - b. 30 second mode
  - c. 1 minute mode**
  - d. 2 minute mode
7. The density value to be entered in the thin lift gauge for the test sections must come from:
- e. The average of 10 readings in the control strip**
  - f. The average density of 3 plugs/cores from the control strip
  - g. 92.5% of maximum theoretical density from the job mix
  - h. The maximum density obtained in the roller pattern
8. How should the stratified reading locations be selected to determine the target nuclear control strip density?
- i. Daily
  - j. Visually
  - k. Professionally
  - l. Randomly**

## Chapter 9 Practice Exercise #1

TL-56(Rev-4/05)

**ASPHALT NUCLEAR DENSITY THIN LIFT  
ROLLER PATTERN - WORKSHEET**

Control Strip No 1Project or Schedule PM-2D-13 Item No. \_\_\_\_\_ Date 9/15/13Route \_\_\_\_\_  
Direction \_\_\_\_\_**Complete this worksheet.****Using the information on this worksheet, complete the TL-57 on the next page.**

(NBL) \_\_\_\_\_

Mix Type SM- 12.5D Application 165 lbs/yd (            kg/m<sup>2</sup>)

Producer Brand X Location Loafers Glory, VA

Roller Type: Roller 1 DD-130 Roller 2 DD-110 Roller 3           

**Roller Pattern Data**

Gauge Model	<u>4640B</u>	Serial No	<u>1212</u>	Calibration Date	<u>7/18/13</u>	Depth Setting	<u>1.5</u> in. (mm)
Pass No	<u>2V</u>	Nuclear Density		Pass No	<u>6(3S)</u>	Nuclear Density	
Site 1		<u>144.6</u>		Site 1		<u>147.8</u>	
Site 2		<u>145.8</u>		Site 2		<u>148.0</u>	
Site 3		<u>144.9</u>		Site 3		<u>147.3</u>	
AVERAGE		<u>145.1</u>		AVERAGE		<u>147.7</u>	
Pass No	<u>3 V</u>	Nuclear Density		Pass No		Nuclear Density	
Site 1		<u>146.5</u>		Site 1			
Site 2		<u>147.6</u>		Site 2			
Site 3		<u>146.8</u>		Site 3			
AVERAGE		<u>147.0</u>		AVERAGE			
Pass No	<u>4 (1S)</u>	Nuclear Density		Pass No		Nuclear Density	
Site 1		<u>148.4</u>		Site 1			
Site 2		<u>149.2</u>		Site 2			
Site 3		<u>148.4</u>		Site 3			
AVERAGE		<u>148.7</u>		AVERAGE			
Pass No	<u>5(2S)</u>	Nuclear Density		Pass No		Nuclear Density	
Site 1		<u>147.9</u>		Site 1			
Site 2		<u>148.5</u>		Site 2			
Site 3		<u>147.8</u>		Site 3			
AVERAGE		<u>148.1</u>		AVERAGE			

Testing Performed by \_\_\_\_\_

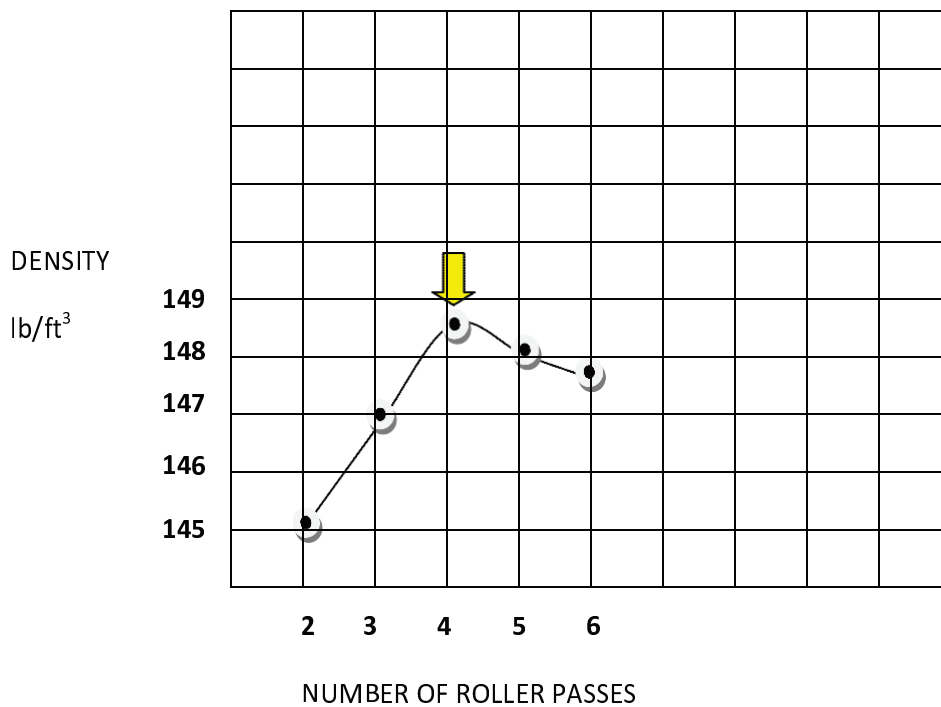
Observed by \_\_\_\_\_

## Chapter 9 Practice Exercise #1 (continued)

TL-57

ASPHALT NUCLEAR DENSITY THINLIFT  
ROLLER PATTERN GRAPH

Control Strip No		<u>1</u>		Date <u>9/15/13</u>	
Project or Schedule	PM-2D-13	Item No		To	<u>11.04</u>
Route	<u>81</u>	From	<u>13.76</u>	Lane	<u>Inside</u>
Directional Lane	SBL			(Inside, Center, etc.)	
	(NBL, SBL, etc)				
Mix Type	<u>SM-12.5D</u>	Application Rate	<u>165</u> lbs/yd <sup>2</sup>	(	<u>                    </u> kg/m <sup>2</sup> )
Producer	<u>Brand X</u>	Location	<u>Loafers Glory, VA</u>		
Gauge		Calibration		Depth	
Model	<u>4640B</u>	Serial No	<u>1212</u>	Setting	<u>1.5</u> in. (mm)
		Date	<u>7/18/13</u>		



Optimum Density	<u>148.7</u>	lbs/ft <sup>3</sup> (kg/m <sup>3</sup> )	
	(from peak of roller pattern curve)		
Optimum Number of Passes:	<u>4</u>		
Number of Roller Passes	Roller 1 <u>3 V</u>	Roller 2 <u>1 S</u>	Roller 3 <u>                    </u>

Testing Performed by

Observed By

*This density was selected because it is the highest density reading before a decrease in density.*

## Chapter 9 Practice Exercise #1 (continued)

TL-58 (Rev. 4/05)

**VIRGINIA DEPARTMENT OF TRANSPORTATION  
ASPHALT NUCLEAR DENSITY THIN LIFT WORKSHEET  
CONTROL STRIP TARGET DENSITY**

		Control Strip Number	1		
Project or Schedule	<u>PM-2D-13</u>	Item Number	<u>                    </u>	Date	<u>9/15/13</u>
Route	<u>81</u>	From	<u>13.76</u>	To	<u>11.04</u>
Directional Lane	<u>SBL</u> <small>(NBL, SBL, etc)</small>			Lane	<u>Inside</u> <small>(Inside, Center, etc.)</small>
Mix Type	<u>SM-12.5D</u>	Application Rate	<u>165</u>	lbs/yd <sup>2</sup>	<u>                    </u>
Producer	<u>Brand X</u>	Location	<u>Loafers Glory, VA</u>		

**CONTROL STRIP TARGET DENSITY DETERMINATION**

Gauge Model	<u>4640B</u>	Serial Number	<u>401</u>	Calibration Date	<u>5/18/13</u>	Depth Setting	<u>1.5</u> in (mm)
-------------	--------------	---------------	------------	------------------	----------------	---------------	--------------------

TEST SITE	DISTANCE	OFFSET	ENTER GAUGE READING		
Site 1	<u>23 ft</u>	<u>2 ft. Lt</u>	<u>148.3</u>	lb/ft <sup>3</sup>	<u>                    </u> (kg/m <sup>3</sup> )
Site 2	<u>44 ft</u>	<u>9 ft. Lt</u>	<u>147.2</u>	lb/ft <sup>3</sup>	<u>                    </u> (kg/m <sup>3</sup> )
Site 3	<u>81 ft</u>	<u>2 ft. Lt</u>	<u>148.1</u>	lb/ft <sup>3</sup>	<u>                    </u> (kg/m <sup>3</sup> )
Site 4	<u>141 ft</u>	<u>6 ft. Lt</u>	<u>149.2</u>	lb/ft <sup>3</sup>	<u>                    </u> (kg/m <sup>3</sup> )
Site 5	<u>149 ft</u>	<u>10 ft. Lt</u>	<u>150.2</u>	lb/ft <sup>3</sup>	<u>                    </u> (kg/m <sup>3</sup> )
Site 6	<u>176 ft</u>	<u>3 ft. Lt</u>	<u>148.7</u>	lb/ft <sup>3</sup>	<u>                    </u> (kg/m <sup>3</sup> )
Site 7	<u>187 ft</u>	<u>9 ft. Lt</u>	<u>147.5</u>	lb/ft <sup>3</sup>	<u>                    </u> (kg/m <sup>3</sup> )
Site 8	<u>213 ft</u>	<u>4 ft. Lt</u>	<u>149.4</u>	lb/ft <sup>3</sup>	<u>                    </u> (kg/m <sup>3</sup> )
Site 9	<u>239 ft</u>	<u>2 ft. Lt</u>	<u>147.4</u>	lb/ft <sup>3</sup>	<u>                    </u> (kg/m <sup>3</sup> )
Site 10	<u>275 ft</u>	<u>3 ft. Lt</u>	<u>147.6</u>	lb/ft <sup>3</sup>	<u>                    </u> (kg/m <sup>3</sup> )
		Total	<u>1483.6</u>	lb/ft <sup>3</sup>	<u>                    </u> (kg/m <sup>3</sup> )
		Average	<u>148.4</u>	lb/ft <sup>3</sup>	<u>                    </u> (kg/m <sup>3</sup> )

Remarks: **REFERENCE LINE IS ON THE RIGHT**

Testing Performed by Isaac ClineObserved by S.F. Miles

VDOT Inspector

## Chapter 9 Practice Exercise #1 (continued)

TL 60 (Rev.4/06)

VIRGINIA DEPARTMENT OF TRANSPORTATION  
ASPHALT NUCLEAR DENSITY WORKSHEET

## ROLLER PATTERN/SAWN PLUGS &amp; CONTROL STRIP TARGET DENSITY

Control Strip No. 1

Schedule PM-2D-13 Item No. \_\_\_\_\_ Date 9/15/13

Route 81 From: 13.76 To: 11.04

Lane Direction: SBL Lane Inside  
(NBL, SBL, etc.) (inside, center, etc.)

Mix Type SM-12.5D Application Rate: 165 lbs/yd<sup>2</sup> ( \_\_\_\_\_ kg/m<sup>2</sup>)

Lot No 2 Width of Application 11 Lot Length 5000 ft (m)

Mix Producer \_\_\_\_\_ Brand X \_\_\_\_\_ Plant \_\_\_\_\_ Location \_\_\_\_\_ Loafers Glory, VA

NUCLEAR CALIBRATION CHECK											
	A	B	C	D	E	F		G		H	
Sawed Spec. Number	Weight in Air (g)	Weight in Water (Total g)	Basket Tare Weight (g)	Weight in Water (g) B - C	SSD Weight In Air (g)	Volume E-D	SSD Bulk Specific Gravity A ÷ F	Average SSD Bulk Per Site	Sawed Specimen Thickness In. (mm)	Target Test Site Nuclear (from TL-58)	
1	1215.2	729.6	xxx	729.6	1223.8	494.2	2.46	2.46	1.5	148.3	1
2	1218.0	732.1	xxx	732.1	1226.7	494.6	2.46		1.5	147.2	2
										148.1	3
3	1222.5	733.9	xxx	733.9	1231.1	497.2	2.46	2.45	1.5	149.2	4
										150.2	5
4	1218.8	728.2	xxx	728.2	1228.3	500.1	2.44		1.5	148.7	6
										147.5	7
5	1209.7	728.0	xxx	728.0	1222.2	494.2	2.45	2.45	1.5	149.4	8
										147.4	9
6	1214.3	729.1	xxx	729.1	1224.8	495.7	2.45		1.5	147.6	10
										1483.5	

Average 2.45  
(Sum of G/3)

148.4  
(Sum of H/10)

Max Specific Gravity (Gmm) 2.644

A. Sawed Specimen Average % Density 92.7  
(avg. SSD Bulk Sp. Gr. / Gmm x 100)

B. Minimum Design Density (Table III – 3 of sec. 315)  
\*(A must equal or exceed B) 92.2

C. Target Nuclear Density 148.4

**Yes, the average percent density exceeds the minimum design density for an SM-12.5D.**

**Core sites 1, 3, 6**

## Chapter 9 Practice Exercise #1 (continued)

TL-59A (12/08)

## Asphalt Concrete Density Quality Control (QC) Test Report – Nuclear

Project/Schedule Number:	PD-2D-13	Item Number:	
Route Number:	81	County:	Mitchell
From (Station, MP, Int., etc.):	13.76	To (Station, MP, Int., etc.):	11.04
Direction (e.g. NB, SB, etc.):	SBL	Lane (Inside, Center, Right, etc.):	Inside
QC Lot #:	2	Application Rate (lbs/sy):	165
Asphalt Mix Type:	SM-12.5D	Asphalt Job Mix Number:	2041-2013-4
Nuclear Gauge Model Number:	4640B	Gauge Calibration Date:	7/18/2013
Nuclear Gauge Serial Number:	1212	Depth Setting (in/mm):	1.5

## Control Strip Information:

95% of Target Density for joint check = 141 lbs/ft<sup>3</sup>

1. Control Strip Number and Date	1	
2. Target Density from Control Strip	148.4	lbs/ft <sup>3</sup> (kg/m <sup>3</sup> )
3. Minimum Density (98% Of Control Strip Target Density)	145.4	lbs/ft <sup>3</sup> (kg/m <sup>3</sup> )
4. Maximum Density (102% Of Control Strip Target Density)	151.4	lbs/ft <sup>3</sup> (kg/m <sup>3</sup> )

## QC Testing Results By Nuclear Gauge:

Location			Nuclear Density			
Sublot No.	Distance	Offset	lbs/ft <sup>3</sup> (kg/m <sup>3</sup> )	lbs/ft <sup>3</sup> (kg/m <sup>3</sup> )	Left (C or U)*	Right (C or U)*
1a	12 ft	2 ft lt	148.2	148.5	147.8 c	144.6 u
1b	429 ft	9 ft lt	148.7		147.0 c	145.8 u
2a	358 ft	2 ft lt	150.1	148.7	148.9 c	146.9 u
2b	812 ft	6 ft lt	147.3		146.8 c	145.7 u
3a	105 ft	10 ft lt	149.9	149.7	148.1 c	146.3 u
3b	620 ft	3 ft lt	149.5		147.3 c	144.2 u
4a	167 ft	9 ft lt	147.5	147.5	145.7 c	143.8 u
4b	589 ft	4 ft lt	148.3		146.1 c	144.5 u
5a	726 ft	2 ft lt	148.4	148.1	147.6 c	146.6 u
5b	412 ft	3 ft lt	147.7		146.0 c	145.1 u
6a						
			Average:	148.6		

Does the QC Test Section: (circle one)

PASS

FAIL

\* - C = Confined Jt, U = Unconfined Jt

This Test Section passes with a density of 148.6 lb/ft<sup>3</sup> which is within the acceptance range of 98-102% (145.4 – 151.4 lb/ft<sup>3</sup>). Also no two consecutive subplot densities are lower than 98% or greater than 102%. Joint densities meet the 95% acceptance requirement of 141.0 lb/ft<sup>3</sup>.

## ASPHALT NUCLEAR DENSITY THIN LIFT ROLLER PATTERN - WORKSHEET

Project or Schedule	Item No.	Date
Route	Complete this worksheet. Using the information on this worksheet, complete the	
Direction	TL-57 on the next page.	
(NBL, SBL, etc.)	(inside, center,	

Mix Type	SM- 12.5D		Application	165	lbs/yd	(	kg/m <sup>2</sup> )
Producer	Asphalt, Inc.		Location	Blacktop, VA			
Roller Type:	Roller 1	DD-130	Roller 2	DD-110	Roller 3		

Serial			Calibration		Depth		
Gauge Model	4640B	No	1212	Date	5/18/13	Setting	1.5 in. (mm)
Pass No	3V	Nuclear Density		Pass No	7 (3S)	Nuclear Density	
Site 1		149.0		Site 1		151.1	
Site 2		145.1		Site 2		148.8	
Site 3		146.9		Site 3		150.9	
AVERAGE		147.0		AVERAGE		150.3	
Pass No	4 V	Nuclear Density		Pass No		Nuclear Density	
Site 1		145.4		Site 1			
Site 2		150.2		Site 2			
Site 3		154.3		Site 3			
AVERAGE		150.0		AVERAGE			
Pass No	5 (1S)	Nuclear Density		Pass No		Nuclear Density	
Site 1		153.0		Site 1			
Site 2		152.3		Site 2			
Site 3		152.1		Site 3			
AVERAGE		152.5		AVERAGE			
Pass No	6(2S)	Nuclear Density		Pass No		Nuclear Density	
Site 1		152.1		Site 1			
Site 2		150.6		Site 2			
Site 3		151.7		Site 3			
AVERAGE		151.5		AVERAGE			

Testing Performed by \_\_\_\_\_ Observed by \_\_\_\_\_

TL-57

### ASPHALT NUCLEAR DENSITY THINLIFT ROLLER PATTERN GRAPH

Control Strip No 1

Project

After completing this worksheet, answer the question at the bottom of the page

Route

Directional Lane

NBL

(NBL, SBL, etc)

Lane

Inside(Inside, Center,  
etc.)

Mix Type

SM-12.5D

Application Rate

165lbs/yd<sup>2</sup>

(

kg/m<sup>2</sup>)

Producer

Asphalt, Inc

Location

Blacktop, VA

Gauge

Calibration

Depth

Model

4640B

Serial No

1212

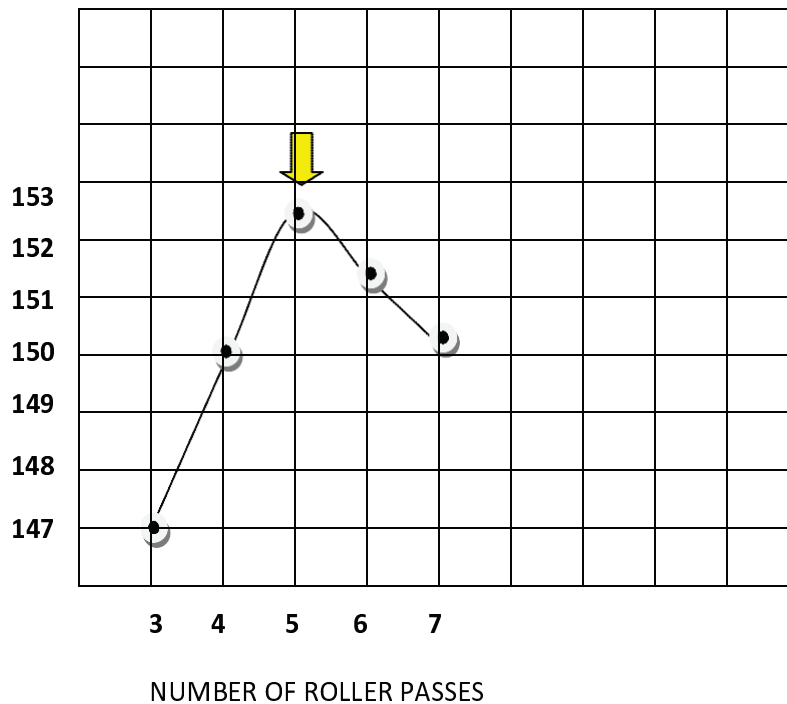
Date

5/18/13

Setting

1.5

in. (mm)



Optimum Density

152.5lbs/ft<sup>3</sup>(kg/m<sup>3</sup>)

(from peak of roller pattern curve)

Optimum Number of Passes:

**5**

Number of Roller Passes

Roller 1

**4 V**

Roller 2

1 S

Roller 3

This density was selected because it is the highest density reading before a decrease in density.

## Chapter 9 Practice Exercise #2 (continued)

TL-58 (Rev. 4/05)

**VIRGINIA DEPARTMENT OF TRANSPORTATION  
ASPHALT NUCLEAR DENSITY THIN LIFT WORKSHEET  
CONTROL STRIP TARGET DENSITY**

Project or Schedule	<u>PM -2D-13</u>	Control Strip Number	<u>1</u>	Date	<u>6/21/13</u>
Route	<u>81</u>	Item Number	<u>8.23</u>	To	<u>17.25</u>
Directional Lane	<u>NBL</u> <small>(NBL, SBL, etc.)</small>	From		Lane	<u></u> <small>(Inside, Center, etc.)</small>
Mix Type	<u>SM-12.5D</u>	Application Rate	<u>165</u>	lbs/yd <sup>2</sup>	<u>( kg/m<sup>2</sup>)</u>
Producer	<u>Asphalt Inc</u>	Location	<u>Blacktop, VA</u>		

**CONTROL STRIP TARGET DENSITY DETERMINATION**

Gauge Model 4640B      Serial Number 1212      Calibration Date 5/19/13      Depth Setting 1.5 in (mm)

**CONTROL STRIP TARGET DENSITY DETERMINATION**

<u>TEST SITE</u>	<u>DISTANCE</u>	<u>OFFSET</u>	<u>ENTER GAUGE READING</u>			
Site 1	<u>8 ft</u>	<u>3 ft lt</u>	<u>152.4</u>	lb/ft <sup>3</sup>	(	kg/m <sup>3</sup> )
Site 2	<u>43 ft</u>	<u>4 ft lt</u>	<u>151.3</u>	lb/ft <sup>3</sup>	(	kg/m <sup>3</sup> )
Site 3	<u>81 ft</u>	<u>2 ft lt</u>	<u>151.9</u>	lb/ft <sup>3</sup>	(	kg/m <sup>3</sup> )
Site 4	<u>99 ft</u>	<u>6 ft lt</u>	<u>151.1</u>	lb/ft <sup>3</sup>	(	kg/m <sup>3</sup> )
Site 5	<u>111 ft</u>	<u>3 ft lt</u>	<u>150.2</u>	lb/ft <sup>3</sup>	(	kg/m <sup>3</sup> )
Site 6	<u>172 ft</u>	<u>2 ft lt</u>	<u>151.9</u>	lb/ft <sup>3</sup>	(	kg/m <sup>3</sup> )
Site 7	<u>192 ft</u>	<u>8 ft lt</u>	<u>152.0</u>	lb/ft <sup>3</sup>	(	kg/m <sup>3</sup> )
Site 8	<u>210 ft</u>	<u>6 ft lt</u>	<u>154.1</u>	lb/ft <sup>3</sup>	(	kg/m <sup>3</sup> )
Site 9	<u>243 ft</u>	<u>3 ft lt</u>	<u>152.7</u>	lb/ft <sup>3</sup>	(	kg/m <sup>3</sup> )
Site 10	<u>278 ft</u>	<u>2 ft lt</u>	<u>150.8</u>	lb/ft <sup>3</sup>	(	kg/m <sup>3</sup> )
Total			<u>1518.4</u>	lb/ft <sup>3</sup>	(	kg/m <sup>3</sup> )
Average			<u>151.8</u>	lb/ft <sup>3</sup>	(	kg/m <sup>3</sup> )

Remarks:

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Testing Performed by \_\_\_\_\_

Observed by \_\_\_\_\_

VDOT Inspector

## Chapter 9 Practice Exercise #2( continued)

TL 60 (Rev.4/06)

**VIRGINIA DEPARTMENT OF TRANSPORTATION**  
**ASPHALT NUCLEAR DENSITY WORKSHEET**

**ROLLER PATTERN/SAWN PLUGS & CONTROL STRIP TARGET DENSITY**

Control Strip No. 1

Schedule PM-2D-13 Item No. \_\_\_\_\_ Date 6/21/13

Route 81 From: 8.23 To: 17.25

Lane Direction: NBL Lane Inside  
 (NBL, SBL, etc.) (inside, center, etc.)

Mix Type SM-12.5D Application Rate: 165 lbs/yd<sup>2</sup> ( \_\_\_\_\_ kg/m<sup>2</sup>)  
 ft (m)

Lot No 2 Width of Application 12 Lot Length 5000

Mix Producer Asphalt, Inc Plant \_\_\_\_\_ Location Blacktop, VA

NUCLEAR CALIBRATION CHECK										
	A	B	C	D	E	F		G		H
Sawed Spec. Number	Weight in Air (g)	Weight in Water (Total g)	Basket Tare Weight (g)	Weight in Water (g) B - C	SSD Weight in Air (g)	Volume E-D	SSD Bulk Specific Gravity A ÷ F	Average SSD Bulk Per Site	Sawed Specimen Thickness In. (mm)	Target Test Site Nuclear (from TL- 58)
1	1134.2	674.8	xxx	674.8	1137.9	463.1	2.449	2.45	1.5	152.4 1
2	1104.3	656.3	xxx	656.3	1106.7	450.4	2.452		1.5	151.3 2 151.9 3
3	1226.1	734.8	xxx	734.8	1227.8	493.0	2.487	2.49	1.5	151.1 4 150.2 5
4	1266.3	760.3	xxx	760.3	1267.9	507.6	2.495		1.5	151.9 6 152.0 7
5	1387.1	828.1	xxx	828.1	1389.8	561.7	2.469	2.48	1.5	154.1 8 152.7 9
6	1590.4	948.8	xxx	948.8	1594.0	645.2	2.465		1.5	150.8 10 1518.4 Total

Average 2.47

(Sum of G/3)

151.8

(Sum of H/10)

Max Specific Gravity (Gmm) 2.653

A. Sawed Specimen Average % Density

93.1

(avg. SSD Bulk Sp. Gr. /Gmm x 100)

B. Minimum Design Density (Table III – 3 of sec. 315)

92.5

\*(A must equal or exceed B)

C. Target Nuclear Density

151.8

Gauge Model 4640B Serial No. 1212 Calibration Date 7/18/13 Depth Setting 1.5 In ( \_\_\_\_\_ mm)

Pay Quantity \_\_\_\_\_ Ton (Metric Ton)

Lot length x width x application rate/ 18000

*Core sites - 3, 6, 7 It passes - the average percent density exceeds the minimum design density for an SM-12.5D.*



## Chapter Ten Ch.10 – questions

### Paving Math Problems

1. Using the information below:
  - a. Calculate the linear feet this truckload of HMA should cover at the specified application rate.
  - b. How many linear feet will each ton of HMA pave?

Application Rate = **185 lb./yd<sup>2</sup>**

Total weight shipped = **33,135 lb.**

Pavement width = **11 feet**

**a. Coverage of truckload in linear feet:**

$$L = \frac{9 \times T}{W \times R} = \frac{9 \times 33,135}{11 \times 185} = \frac{298,215}{2035} \quad 146.54 \text{ or } 146.5 \text{ linear feet}$$

**b. Coverage per ton in linear feet:**

$$L = \frac{9 \times T}{W \times R} = \frac{9 \times 2000}{11 \times 185} = \frac{18,000}{2035} \quad 8.84 \text{ or } 8.8 \text{ linear ft/ton}$$

2. Using the information below:
  - a. Calculate the linear feet this truckload of HMA should cover at the specified application rate.
  - b. How many linear feet will each ton of HMA pave?

Application Rate = **165 lb./yd<sup>2</sup>**

Total weight shipped = **127,580 lb.**

Pavement width = **24 feet**

**a. Coverage of truckload in linear feet:**

$$L = \frac{9 \times T}{W \times R} = \frac{9 \times 127,580}{24 \times 165} = \frac{1,148,220}{3960} \quad 289.95 \text{ OR } 290 \text{ linear feet}$$

**b. Coverage per ton in linear feet:**

$$L = \frac{9 \times T}{W \times R} = \frac{9 \times 2000}{24 \times 165} = \frac{18,000}{3960} \quad 4.54 \text{ or } 4.5 \text{ linear ft/ton}$$

3. Using the information below:
- Calculate the linear feet this truckload of HMA should cover at the specified application rate.
  - How many linear feet will each ton of HMA pave?

Application Rate = **158 lb./yd<sup>2</sup>**

Total weight shipped = **46,778 lb.**

Pavement width = **12 feet**

**a. Coverage of truckload in linear feet:**

$$L = \frac{9 \times T}{W \times R} = \frac{9 \times 46,778}{12 \times 158} = \frac{421,002}{1896} \quad 222.04 \text{ OR } 222 \text{ linear feet}$$

**b. Coverage per ton in linear feet:**

$$L = \frac{9 \times T}{W \times R} = \frac{9 \times 2000}{12 \times 158} = \frac{18000}{1896} \quad 9.49 \text{ or } 9.5 \text{ linear ft/ton}$$

4. The Contractor has uniformly applied **610** gallons of undiluted CRS-1 emulsion to a section of roadway for a tack coat. The tack covers **5250** linear feet in length at a width of **11** feet.

- a. What is the application rate of the tack coat? \_\_\_\_\_ gal/yd<sup>2</sup>.  
b. Does this meet specification?

**What is the application rate of the tack coat?**

**0.1 gal/yd<sup>2</sup>**

**Does this meet specification?**

**Yes**

$$R = \frac{9 \times T}{W \times L} = \frac{9 \times 610}{11 \times 5250} = \frac{5490}{57750} \quad 0.095 = 0.1 \text{ gal/yd}^2$$

Spec for undiluted: 0.05-0.10 gal/yd<sup>2</sup>

Spec for diluted: 0.10-0.15 gal/yd<sup>2</sup> (Section 310.03)

5. The Contractor has uniformly applied **2154** gallons of undiluted CRS-1 emulsion to a section of roadway for a tack coat. The tack covers **38,016** linear feet in length at a width of **12** feet.

- a. What is the application rate of the tack coat? \_\_\_\_\_ gal/yd<sup>2</sup>.  
b. Does this meet specification?

**What is the application rate of the tack coat?**

**0.04 gal/yd<sup>2</sup>**

**Does this meet specification?**

**No**

$$R = \frac{9 \times T}{W \times L} = \frac{9 \times 2154}{12 \times 38,016} = \frac{19,386}{456,192} \quad 0.042 = 0.04 \text{ gal/yd}^2$$

Spec for undiluted: 0.05-0.10 gal/yd<sup>2</sup>

Spec for diluted: 0.10-0.15 gal/yd<sup>2</sup> (Section 310.03)

6. The Contractor has uniformly applied **3320** gallons of undiluted CRS-1 emulsion to a section of roadway for a tack coat. The tack covers **29,040** linear feet in length at a width of **12** feet.

- a. What is the application rate of the tack coat? \_\_\_\_\_ gal/yd<sup>2</sup>.  
b. Does this meet specification?

**What is the application rate of the tack coat?**

**0.09 gal/yd<sup>2</sup>**

**Does this meet specification?**

**Yes**

$$R = \frac{9 \times T}{W \times L} = \frac{9 \times 3320}{12 \times 29,040} = \frac{29880}{348,480} \quad 0.085 = 0.09 \text{ gal/yd}^2$$

Spec for undiluted: 0.05-0.10 gal/yd<sup>2</sup>

Spec for diluted: 0.10-0.15 gal/yd<sup>2</sup> (Section 310.03)

7. A load of IM-19.0A arrived at the project to be placed at 220 lb./yd.<sup>2</sup> with one breakdown roller on the job and a base temperature of 50°F, what is the minimum laydown temperature?
- a. 250°F
  - b. 304°F
  - c. 295°F**
  - d. 353°F
8. A load of SM-12.5A arrived at the project to be placed at 175 lb./yd.<sup>2</sup> with two breakdown rollers on the job and a base temperature of 40°F, what is the minimum laydown temperature?
- a. 330°F
  - b. 338°F
  - c. 250°F
  - d. 289°F**
9. A load of SM-12.5A arrived at the project to be placed at 185 lb./yd.<sup>2</sup> with one breakdown roller on the job and a base temperature of 45°F, what is the minimum laydown temperature?
- a. 300°F
  - b. 318°F**
  - c. 287°F
  - d. 307°F
10. A load of IM-19.0A arrived at the project to be placed at 190 lb./yd.<sup>2</sup> with two breakdown rollers on the job and a base temperature of 52°F, what is the minimum laydown temperature?
- a. 308°F
  - b. 338°F
  - c. 281°F
  - d. 274°F**
11. The 8 minute maximum breakdown rolling time is specified when 2 or more rollers are used in breakdown rolling.
- a. True**
  - b. False

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